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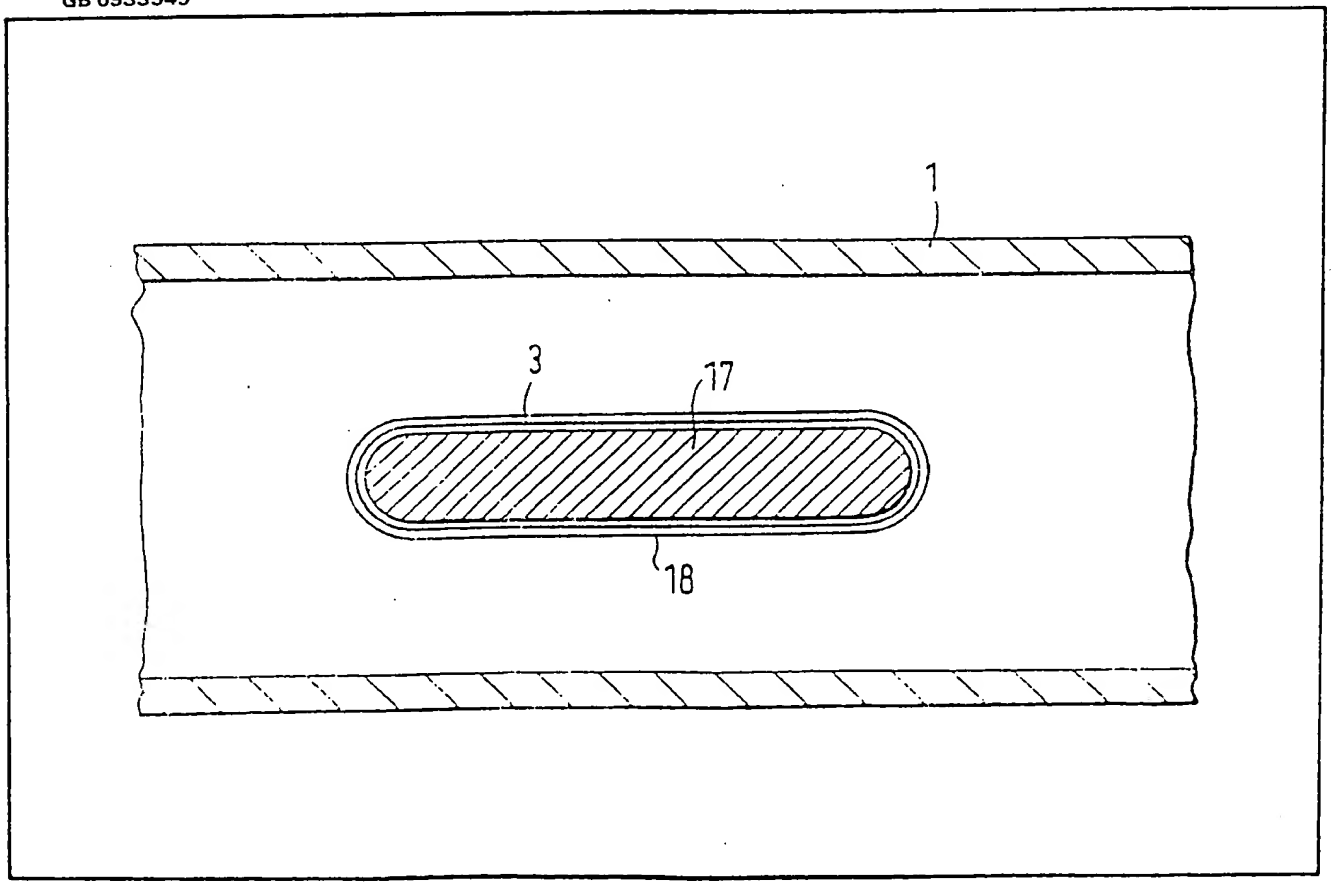
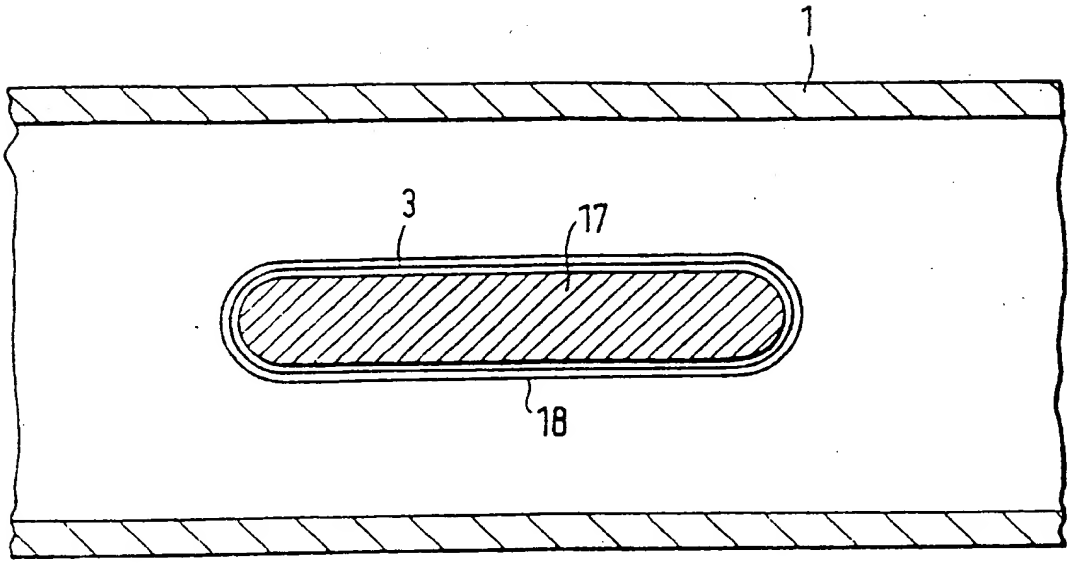
(54) Electrical gas discharge polymerization method of coating a resistor

(57) A method of providing a corrosion-resistant hydrophobic protective layer (18) of dielectric material on a temperature-dependent resistor (3) comprises subjecting the resistor to a monomeric organic substance (e.g. hexamethyl disiloxane or hexafluoropropylene) which is polymerized on the surface of the resistor from the vapour phase with the assistance of energy from an electrical gas discharge. The polymerization is interrupted at least once so as to promote nucleus formation (seed formations) and provide a pinhole-free layer.

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SPECIFICATION

Method of coating a resist r

The present invention relates to a method of providing a protective layer on temperature-dependent resistor.

A measuring probe is known in which a temperature-dependent resistor formed as a layer is in direct contact with a flowing medium. The resistance layer is subject to corrosive attack from the medium and measurement errors are caused by any electrical conductivity of the medium and/or change in the heat transfer resistance.

According to the present invention there is provided a method of providing a corrosion resistant hydrophobic protective layer of di-electrical material on a temperature-dependent resistor, comprising the steps of subjecting the temperature-dependent resistor to a monomeric organic substance which is polymerized on the surface of the resistor from the vapour phase with the assistance of energy from an electrical gas discharge, and interrupting the polymerisation at least once.

The polymerization may be effected by a non self-maintaining as discharge which is sustained by thermionic emission electrons, or by a self-sustaining glow discharge.

A thin, such as about 0.1 to 2 μm thick, closed layer possessing extremely small heat transfer resistance can be produced, which inhibits deposits by hydrophoby and thereby provides long-term stability of the resistor.

By interrupting, at least once, the polymerization process, nucleus formation (seed formation) during the condensation is repeatedly promoted, so that a pinhole-free layer is formed.

An example of the present invention will now be more particularly described with reference to the accompanying drawing, the single figure of which is a schematic view of a temperature-dependent resistor coated by a method exemplifying the invention and arranged as a measuring probe in an engine induction duct.

Referring now to the drawing, there is shown an induction duct 1 of an internal combustion engine, through which air inducted by the engine can flow. Arranged in the duct 1 is a temperature-dependent resistor 3 serving as a measuring probe for the flow rate of the inducted air. The resistor 3 may be formed as a resistance layer or coating applied by a known process to one or both sides of support 17. If the support 17 is made from an electrically conductive material, then an insulating layer (not shown) is provided between the resistance layer and the support 17. A dielectric, corrosion-resistant, pinhole-free, hydrophobic protective layer 18 is applied to the resistance layer. The protective layer 18 should, if possible, be no thicker than 4 μm, preferably 0.5 μm, so that the heat transfer between the flowing air and the resistance layer is impeded as little as possible and the measuring probe can respond rapidly to temperature changes. The protective layer is an organic substance, preferably a silicon-organic substance, which is precipitated from the vapour phase by radiation polymerization. Hexamethyl disiloxane or hexafluoro-propylene may be used as the starting monomer for such polymerization. Starting materials of such a type for the production of a protective layer by polymerization are disclosed in, for example, DE-OS 2 263 480, DE-AS 2 537 416 and DE-OS 2 625 448. Also disclosed in these specifications are methods of precipitating a layer by polymerization from the vapour phase by means of energy from an electric gas discharge. Thus the polymerization can be effected by a non self-maintaining gas discharge sustained by thermionic emission electrons, or by a self-sustaining glow discharge. The polymerization operation is interrupted at least once, causing nucleus formation to be promoted afresh during condensation and a pinhole-free layer to be formed by multiple condensation.

A resistance layer provided with a protective layer by a method examplifying the invention may, when used for air flow rate measurement, be protected from corrosive attack by the flowing air and may avoid measurement errors arising from any electrical conductivity of the air or from a change in the heat transfer resistance due to deposits.

Claims

1. A method of providing a corrosion-resistant hydrophobic protective layer of dielectric material on a temperature-dependent resistor, comprising the steps of subjecting the temperature-dependent resistor to a monomeric organic substance which is polymerized on the surface of the resistor from the vapour phase with the assistance of energy from an electrical gas discharge, and interrupting the polymerization at least once.

2. A method as claimed in claim 1, wherein the polymerization is effected by a non self-maintaining gas discharge which is sustained by thermionic emission electrons.

3. A method as claimed in claim 1, wherein the polymerization is effected by a self-sustaining glow discharge.

4. A method as claimed in any one of the preceding claims, wherein the substance is a silicon-organic substance.

5. A method of providing a corrosion-resistant hydrophobic protective layer of dielectric material on a temperature-dependent resistor, substantially as hereinbefore described with reference to the accompanying drawing.

6. A temperature-dependent resistor provided with a corrosion-resistant hydrophobic protective layer of dielectric material by a method as claimed in any one of the preceding claims.

New claims or amendments to claims filed on 16 December 1982

Superseded claims 1

New or amended claims:—

1. A method of providing a corrosion-resistant

hydrophobic protective layer of dielectric material on a temperature-dependent resistor, comprising the steps of subjecting the temperature-dependent resistor to a monomeric organic substance, which is polymerized on the surface of the resistor from the vapour phase with the assistance of energy from an electrical gas discharge and which is such as to provide a corrosion resistant hydrophobic dielectric polymer, and interrupting the polymerization at least once.

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